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THE REGION OF MAXIMUM INACCESSIBILITY IN THE ARCTIC

By Vilhjalmur Stefansson

Most people imagine that the degree of inaccessibility of polar regions depends mainly on latitude. This is not true, nor is the problem so simple that it can be stated briefly. Neither are the facts sufficiently known as yet for a final and correct answer. But we do understand many of the conditions that modify the problem and an approximate statement of them is possible.

The main condition that determines the comparative accessibility of points within the polar regions is the configuration of the lands and their effect upon the ocean currents. The great oceans, the Atlantic and the Pacific, are similar in that each has its own warm current, but they differ fundamentally in this: that the Japan Current of the Pacific is effectually shut out from the Arctic on that side by the chain of the Aleutian Islands, so that instead of flowing north into the polar sea to melt away the ice, it expends its heat chiefly along the coast of southern Alaska and the western coast of Canada and the United States, profoundly modifying the climate of those regions. But in the Atlantic the Gulf Stream flows unhindered northward through the wide and deep gap between Norway and Greenland, splitting on Iceland and giving it a climate approximating that of Scotland. We may truthfully think of the Gulf Stream as melting away the polar ice (which otherwise would come down to the northern coast of Iceland) with such effect that ships can sail ten or eleven degrees (or seven hundred miles) farther north on the Atlantic side than they can on the Pacific side of the Arctic.

Two Stages of Approach

Up to the present, polar exploration has been conducted in two stages. First, men sail towards the unexplored area as far as they can go in ships. From this point they travel with sledges hauled by dogs or men and in some cases by both.

In connection with this article I have prepared a map showing graphically, although with only approximate correctness, the comparative accessibility of various points within the arctic regions. The most northerly points known to have been attained by ships under sail or steam have been plotted on this map, and lines have been drawn connecting these points. It is possible that in certain places a ship could sail a little farther north; but no ship has as yet done so, and in general we may consider this the area "inaccessible to ships."

Beyond the farthest points yet attained by ships the exploration of the polar regions has been carried on mainly by men or dogs drawing sledges loaded with supplies upon which both men and dogs depended for subsistence. In some cases the length of the journey has been somewhat extended by the killing of the dogs originally used as draft animals and the conversion of their flesh to use as food either for the remaining dogs or for the men.

The "Pole of Inaccessibility"

It will be generally conceded that the best journey so far made by this method was that of Admiral Peary from Cape Columbia to the Pole. This is a linear distance of about 500 geographical miles. To show graphically some of the points that by this method have an inaccessibility comparable to that of the Pole itself, a distance of 500 miles has been allowed for along the meridians on which Nansen, DeLong, Collinson, and others attained their farthest north by ship, either under steam or sail. These positions are marked on the map by dots enclosed in small circles. From the dots have been drawn arcs of circles of 500-mile radius. The intersecting arcs delimit the inner border of a zone of "comparative accessibility" considered from the point of view of a system of exploration similar to Peary's. The area enclosed by the intersecting arcs—stippled on the map—is the area of "comparative inaccessibility." Any point within it is less accessible than the North Pole. The average rate of Peary's travel was about 12 miles a day, so that in five days a distance of sixty miles was covered. Isochronic lines representing this distance have been drawn within the area of comparative inaccessibility. The center—determined by the intersection of arcs with centers at the ships' positions of Peary, Berry, and Nansen—is the "Pole of Inaccessibility." It is the point within the arctic regions most difficult of access for any explorer who first goes as far as he can by ship and then pushes forward by the use of men and dogs hauling sledges.

When the time of exploration by airplanes or dirigibles shall come, this map will still express roughly the comparative inaccessibility of various points within the polar regions, for the presumption is that such flights would be made from bases established by ships under steam. Of course, it will eventually become possible to fly direct from any such city as New York or London to any point within the northern hemisphere, and for such undertakings this map will have no significance.

Factors Modifying the Theoretical Results

Should anyone desire to use this map as the basis either for the planning of an actual polar expedition or for the illustration of theories upon the subject, he will have to bear in mind various modifying factors, the most important of which are the following:

1. When traveling over the surface of the mobile north-polar ice the first difficulty is with currents. For instance, it is possible to sail comparatively near the North Pole in the longitude of Spitsbergen; but Parry and most of his followers found that when they strove to march north in this region their

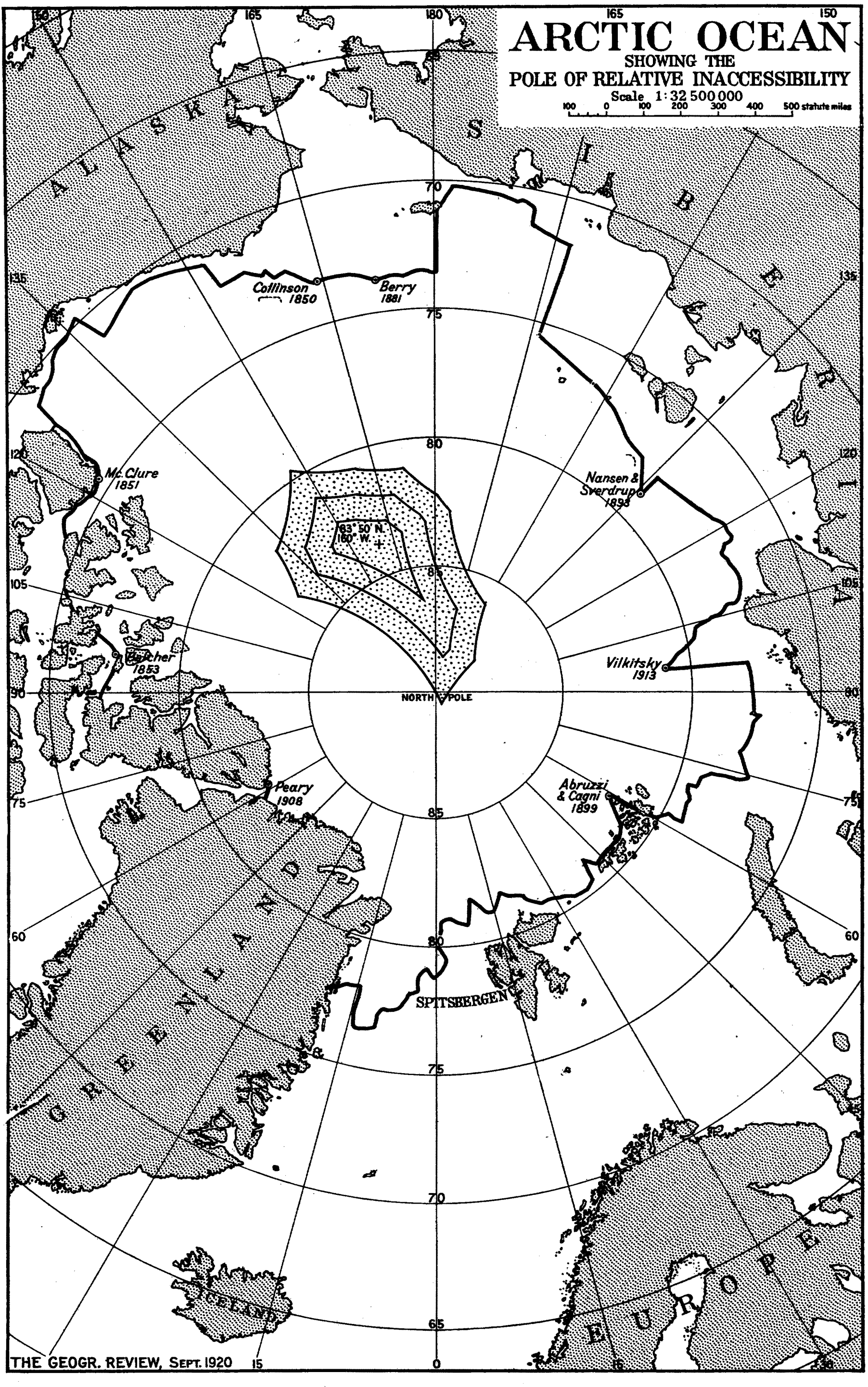

FIG. 1—The entire area outside of the heavy solid line may be called the "Zone of Approach by Ship;" the area within it the "Zone of Man-and-Dog Travel." The stippled portion of the latter is the "Zone of Comparative Inaccessibility." The distance between the isochronic lines is five days dog-sledge travel or 60 miles. Incidentally the map shows the superiority of Peary's position of 1908 over all others on land as a base for a dash aimed at the point of latitude 90° N. It is also favorably situated for an attack on the "Pole of Inaccessibility," which is only 200 miles farther away from Peary's base than the North Pole.

efforts were in part cancelled by the continuous southward drift of the ice over which they were traveling. Our own work has shown that a similar southward drift, although perhaps not so strong a one, would have to be faced by anyone traveling north near the 138th meridian W. To the north of Grant Land Peary found an eastward drift though it did not handicap him materially. It is probable, on the other hand, that anyone starting north from Wrangell Island or the New Siberia Islands would get considerable help from a current running partly in his favor.

2. At times an even more serious handicap than an adverse current is the frequency of open leads. Judging from the narratives of polar explorers, this particular handicap is most serious in the region north of eastern Siberia, where Baron Wrangell traveled a century ago, and in the belt of generally similar conditions north of Alaska with which I have personal acquaintance. This handicap is of little weight northwest of Prince Patrick Island, as I have found by experience, and northwest of Cape Thomas Hubbard and north of Cape Columbia, as shown by the narratives of Peary and MacMillan.

3. In regions where currents are violent the ice is broken up with a resulting formation not only of the leads of open water which we have considered, but the heavy pressure ridges which make sledge travel more arduous and occasionally compel actual road making with pickaxes. The trouble with pressure ridges is generally greatest near land and becomes less and less as one goes farther from shore. They are the more troublesome the younger the ice. It seems now fairly clear that much of the polar ice is formed originally on the American and Siberian side of the Arctic and drifts across past the northern end of Greenland towards Franz Josef Land where it vanishes in the Gulf Stream.

This is one of the many reasons which made Peary's "American route to the Pole" the most desirable. Not only could he sail farther north by ship and then have comparatively few leads to contend with, but he had the added advantage of traveling in considerable part over ice which had been formed many years earlier, perhaps in the Beaufort Sea, and had been drifting towards Greenland and gradually thickening season by season until it was comparatively smooth and stable.

4. We have now considered the main points which must be kept in mind in interpreting the rather rigid data of the map. There remains a matter which was of little consequence to Wrangell, Nansen, or Peary. In their work they counted little upon replenishing their stock of food and fuel and thus making their journeys longer and easier through the killing of local animals, such as seals, polar bear, or fish. The presence of these, except near land, was either unsuspected or ignored; it formed no basis of their calculation and did not in practice affect their results materially. But in the system of "living off the country"[1] the animal life of the region is vitally important.

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[1] Vilhjalmur Stefansson: "Living Off the Country" as a Method of Arctic Exploration, *Geogr. Rev.*, Vol. 7. 1919, pp. 291–310.

THE QUESTION OF FOOD SUPPLY

From my study of north polar conditions I conclude that the amount of animal life has no direct relation to latitude. We have already seen that the North Pole by no means corresponds to the Pole of Inaccessibility which is distant from it by more than 400 miles. The North Pole lies, therefore, towards the edge of the area that is difficult of access through being covered with floating ice. It might seem more reasonable to suppose, then, that the amount of animal life would vary with distance from the Pole of Inaccessibility, but that does not seem to be the case either.

In the present discussion we shall ignore all forms of life except the seal, for this is the only animal upon which it appears practical to rely. We have seen whales and fish as far from land as we have seen seals, but in planning a journey over the ice I think it unlikely that I should ever trouble enough about animals other than the seal to carry equipment for securing them. It is probable that seals have no great difficulty anywhere within the polar area in securing food and that the most serious condition they have to fight is the massing of the ice in such a way that they cannot come up to breathe. In the summer it can be assumed that most of the seals are in open water; that is, they are either living in neighborhoods where there are scattered ice cakes like islands in a sea of water or else where there are open leads running like great rivers across the ice fields. In autumn the water of the leads will freeze over, at first with a thin ice that can be easily broken; but when this ice gets to be four inches or more in thickness the seal has to keep open a breathing hole by gnawing. Seals that live in comparatively level bay ice near land (and the same is doubtless true of seals living under level patches of ice on the ocean) have commonly several breathing holes, perhaps half a dozen or more, scattered over two or three acres of area. These holes are of necessity cigar-shaped, so as to admit the body of the seal when the ice gets several feet thick. The actual breathing hole to the surface is the size of the mouth of a water tumbler, or even smaller, and may be covered with snow. Presumably the seal, in looking up when swimming about in the water, can see light patches where his breathing holes are, and thus he is enabled to find them again after having descended to feed. He does not have to go deep to feed, for he lives mainly on the floating animal life near the surface rather than on fishes, although he gets a few of these also. He is stationary with reference to his breathing holes but continually moving with reference to the sea bottom and traveling in the same direction as the ice under which he lives.

It has been understood now for decades that a ship that freezes in the ice near Wrangell Island or the New Siberia Islands will arrive three or four years later in the ocean north of the Atlantic. Similarly, a seal that finds himself in the vicinity of Wrangell Island in the fall of a certain year will, in all probability, find himself two or three years later in the vicinity of Spitsbergen. Assuming that the ice that drifts across the Pole of Inaccessibility, or the North Pole for that matter, was originally formed in the Beaufort Sea where seals are known to be abundant, it will follow that a certain number of seals are continually being carried across either Pole.

"Ice Deserts"

But there are undoubtedly in the Arctic certain "ice deserts." These are regions similar to the Sargasso Sea. In them pressure due to winds or currents operating from a distance heaps the ice up, and it may even remain in an eddy for years. We found one such region north of Prince Patrick Island. Seals were not absent but they were comparatively rare, and they became more numerous again when we got farther north. On coming to such an ice desert the traveler who depends on some method similar to ours, where the main reliance for food and fuel is upon seals, will find that he is face to face with a problem similar to that of a traveler who, in crossing an unknown continent in tropical or temperate regions, finds himself gradually entering a desert produced by lack of rain. Such a traveler overland would have to depend upon his judgment. He might avoid the desert by skirting it; he might turn back, giving up his journey for the time being; or he might make a dash across, hoping that his resources would take him to the farther side of the hostile area. Just such a problem one would have to face in ice travel on coming to a region where an eddy existed and where massed ice had evidently persisted for years.

That is, it would be a problem to a party trying to live by forage. To a company using the Peary pemmican-and-relay system it would constitute no problem at all. They would care about the smoothness, stability, freedom from leads of the ice, and under these heads they might find the conditions excellent—they probably would. For the presence or absence of seals beneath their feet they would care not at all.

But for those who count on getting their food and fuel as they go, these ice deserts are the one source of gravest concern. We cannot tell in advance for certain where we shall find them, for we can reason only on the basis of what we know and in the Arctic there are still many things unknown. When we come to the edge of such deserts we can guess only very roughly at their extent or in what direction the diameter will be least. They are, in the system of "living by forage," the most serious source of danger, although the mere understanding of their existence lessens the danger.